Measuring Heat Storage Coefficient of Porous Solid Matrix at Interstitial Gas Pressures by Modified Plane Heat Source

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In the present era of rapidly developing technology and energy economics, thermal insulation is an essential part of the environment. For selection of a proper insulating material, the experimental determination of heat storage coefficient at various environmental conditions becomes a basic requirement. Keeping this in mind, a technique developed by us is further modified for the direct determination of heat storage coefficient of porous solid matrix at interstitial gas pressures. A silk insulated constantan wire was used as the heater of the source and was laid down in the form of flat circular grid. The lateral distance between each wire was 0.1 cm and was kept uniform throughout the grid. Three copper constantan thermocouples in the form of a triangle were placed near the center of flat circular grid for recording the temperature. The heating element thus prepared was compressed and placed between two flat sheets of copper having diameter 5.7 cm and thickness 0.007cm. The whole assembly was fixed between two circular Bakelite rings each of 0.2 cm thick, having inner diameter 5.4 cm, slightly greater than the diameter of heating element. Free ends of the heater wire were soldered to thick copper leads. The pressure chamber used was a hollow copper cylinder of diameter 24 cm and length 35 cm fabricated from a thick sheet and was sturdy enough to bear a pressure of 5 atmospheres. The heat storage coefficient of foam like materials of high porosity with varying interstitial gas pressures is determined by the suggested technique. The results obtained are in good agreement with the estimated values from known data of thermal conductivity and diffusivity of the materials.